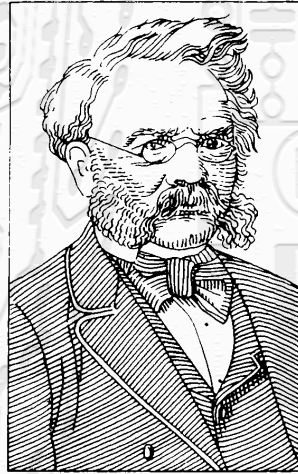


WHEN ELECTRONICS WAS YOUNG (6)

After Morse had instigated the world's first telegraph line in 1843, practical men developed this new means of communications, and constructed improved and more reliable equipment. Before long overland lines were no longer sufficient and intercontinental lines were proposed. In 1850, a cable was laid between Dover and Calais. A similar operation failed when it was first tried in the Mediterranean (between Sardinia and Algeria), owing to that sea being much deeper in places than the English Channel. Only in 1857 did Newall & Co, with Werner von Siemens as adviser, achieve success and the first deep-sea cable was laid.



**Werner von Siemens
(1816...1892)**

Following this success, the *Agamemnon* and *Niagara*, cable-laying ships of the London-based Atlantic Telegraph Company, laid 4,000 miles of cable linking Europe and America. When the work was completed in August that year, Queen Victoria and President Buchanan exchanged telegrams of congratulation. Three weeks later, the connection was suddenly interrupted and the telegraph machines stopped; it seems likely that moisture had penetrated the insulation of the cable. The fault was never found; to this day the cable lies at the bottom of the Atlantic.

It took many years before funds had been raised to attempt another trans-Atlantic cable. This was undertaken by the newly

formed Telegraph Construction and Maintenance Company, using the biggest ship then afloat – the *Great Eastern*. This paddle steamer had a complement of 500 men, including 120 engineers and technicians of the cable company. It took five attempts, but in 1866 the permanent link between Europe and America was finally established.

By the end of the 19th century more than 250,000 miles of cable had been laid, establishing well over 300 links. Today, just over a century later, the cable link between France, Great Britain and the United States, finished in 1988, consists of a single fibre-optic cable, TAT-8, which is 4114 miles (6620 km) long, and carries most of the television, telephone, and data processing signals between these countries. An even later one (1992), TAT-10, is a direct 4436 mile (7320 km) long fibre-optic link between the USA and Germany via the Netherlands.

Of course, not everybody involved in physics and electrical engineering during the 19th century was concerned with cable-laying. In 1856, Ernst Werner von Siemens (1816–92) demonstrated a small, manually-operated dynamo that used a permanent magnet, and in 1866, the series dynamo. It was not until the Belgian-French inventor Zénobe Théophile Gramme (1826–1901) had built the first commercially practical generator for producing alternating current in 1867, however, that the world's first public electrical power plant could be taken into use (in Godalming, England, in 1881). The alternator used in this plant, manufactured by the firm of Siemens & Halske, developed 746 kilowatts.

In 1879, in America, Thomas Alva Edison (1847–1931) and in England, the British physicist and chemist Sir Joseph Wilson Swan (1828–1914) simultaneously introduced the first practical carbon filament lamp, which was a great improvement on the mercury arc lamp first demonstrated by Professor Wray on the Hungerford Suspension Bridge in London on 3 September 1860.